Operating Instructions:

The MicroFlo and MediFlo model MFC's use a 9-pin D-Sub connector that is configured with the following pin-outs. Note that an "a" or a "b" means either a or b, depending on configuration:

Pin #	Description	Symbol	User Selectable Configuration
1	Input Power	V+	(+12V, +15V or +24V)[1]
2	Control Signal	Vc	(0-5V, 0-10V, 1-5V, or 4-20mA)[1]
3	Flow Signal Out	Vo	(0-5V, 0-10V, 1-5V, 1-10V)
4a	Purge	Pg	Apply a ground to open valve full to purge gas line.
4b	RS232 Transmit	Tx	RS-232 Transmit out for RS-232 Configured MFC's
5	Power Ground	Gp	Valve & Heater Return & RS232 Ground Reference
6	Signal Ground (Vc)	Gsc	Control Signal Ground Reference
7	Signal Ground (Vo)	Gso	Flow Signal Out Ground Reference
8	Custom Control	Cc	Custom Feature Enable (4-20mA Return)
9a	Cal Select	Cs	Ground for Cal-A; Open for Cal-B / RS232 Rx-in
9b	RS232 Rx	Rx	RS-232 Receive in for RS-232 Configured MFC's

Input Power (Pin-1): The MFC operates for a single power supply and its voltage must not fall more than 5% below the rated input voltage for proper operation. If a lower voltage MFC is desired contact the factory.

Control Signal (Pin-2): The control signal is an analog signal used to "Set" the desired flow rate. This signal must be referenced to signal ground, precise and drift-free. If the control signal at the MFC connector is not accurate and drift-free it will be a source of erroneous flow performance.

Flow Signal Out (pin-3): This signal is an analog output voltage from 0-5V, which represents the rate of flow being controlled by the MFC. The percentage that the Flow Signal Output voltage to its full range (5V) is the percentage of the flow set point is to its full-scale range. For instance, if Vo = 625mV and the full-scale flow range of the MFC is 2 SLPM then the current flow rate is 0.625V/5V*2SLPM = 0.250 SLPM. The accuracy of this signal is represented by the linearity specification of the unit purchased. Since the MicroFlo's base-model MFC's are not linearized (with the exception on Helium and Hydrogen) this correlation does not follow as accurately. A Test Data Sheet can be purchased with the MicroFlo to accurately resolve flow rate information using the piece-wise linear equation provided on the data sheet.

Purge/RS-232 Tx (pin-4): This pin is configured for one of two functions. The PURGE function allows the gas line to be purged of foreign gases that get into the gas line when gas bottles are changed or other disruption to the gas line occurs. Apply a ground potential to this pin and the internal valve opens full to flood the gas line with the desired gas. The RS-232 Tx function allows RS232 communication where this pin transmits the RS232 signal to a computer via hyper terminal. This pin should be connected to the Receive pin on the computer's serial connector. If RS232 is configured then the PURGE function is available & enabled by an RS232 "command".

Power Ground (pin-5): Provides a direct return for the valve current, heater current, RS-232 digital-ground reference. Signal Ground is also tied to this pin right at the connector.

Signal Ground (pin-6/7): The signal grounds are tied together inside the MFC so there is no requirement to assign Gsc or Gso to a particular signal ground pin. Signal Ground is tied to power ground right at the D-Sub connector.

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[1] User selected when ordering

Custom Control (pin-8): This pin is reserved for any custom control features that may be requested by the customer (i.e. 4-20mA Return, Valve-Off, Pressure Sensor Output, Flow Sensor Output, Others…)

Cal-Select (pin-9): The Cal-Select pin is used to select CAL-A or CAL-B on those MFC's that have two calibrations. If a single calibration MFC was purchased then there need not be a connection to this pin at all. If the RS232 capability was configured then this pin serves as the "Receive" (Rx) for the on-board uP. This pin should be connected to the Transmit pin on the computer's serial connector. If RS232 is configured then the Cal-Select function is enabled by an RS232 command.

Gas Connections: The MFC accepts 10-32 straight thread fittings with an o'ring seal. The o'ring should be 0.320" OD with a 0.070 chord. Parker A-Lok or Swagelok SS-200-1-0157 series will work. Connect gas so that the flow is in the direction of the arrow label on the side of the MFC.

Performance: Refer to the Performance Specification on the Internet at www.pneucleus.com

4-20mA Configuration: Units configured for 4-20mA will accept a 4-20mA current into Pin-2 of the DB9 to linearly control its flow or pressure. The 4-20mA read back signal is sourced by an internal amplifier whose output is on pin-3 of the DB9, fed through the *users* sense-resistor and must return to Pin-8 of the DB9 to complete the loop. The 20mA current must not result in a voltage measured at Pin-2 of the DB9 to exceed 5.25V. The voltage measured at pin-3 of the DB-9 can rise to two volts (2V) less than the input voltage of the device (Pin-1 of the DB9). For a +24V unit the impedance seen by Pin-3 of the DB9 cannot exceed 750 ohms.

Cal Select Jumper:

This jumper is located on the top of the unit, to the right of the D-sub connector if you are looking at the MFC/MFM with the label containing the Pneucleus part number and Serial number facing you. As Shown in figure 1, Cal A is engaged when the jumper is not shorted, and Cal B is engaged when the jumper is shorting the 2 pins. If the unit is in Analog user mode, explained below, the jumper must be used to select the active calibration, if the unit is in RS-232 user mode, the jumper only determines what calibration the unit uses by default, that is, at start up. Once the unit is powered on the user must switch the active calibration via a software command, detailed in the RS-232 User mode section.

Figure 1:

Analog User Mode:

The MFC can be operated in 2 configurations, local or remote control mode, depending on the position of the jumper shown in figure 2. With the jumper in Remote Vc mode the unit will respond to control voltage applied to Pin 2 in the range outlined on the label. With the jumper in the Local Vc position, the MFC will be set according to the voltage set by the Local Vc Adjust potentiometer. This is done by the end user monitoring the Flow Out reading on Pin 3, and adjusting the potentiometer until the desired Flow rate is achieved.

For example: If your MFC has a full-scale flow rate of 100ccm and the voltage range of the unit is 0-5 V and you wish to set a flow rate of 50ccm, you would adjust the potentiometer until the output on Pin 3 is equal to 2.5 volts.

Figure 2:
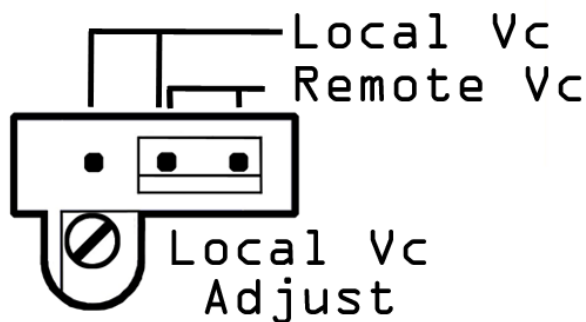
RS232 User Mode:

Serial Port Set-Up: 8-Bit, Baud Rate: 9600, Parity: None, Stop Bit: 1

Upon power-up you will receive no prompt from the MFC on your monitor. You must initiate communication first by typing the Default Address followed by a comma and a command… The Factory Default Address is ID0 and to initiate communication exchange we recommend entering "ID0,M" to bring up the Command Menu…

Enter "?" following the commands below for a brief explanation of the purpose of the command…

For Example: "ID0,S?" will display "Flow Set Point (Sxx.xx/Sxxxxx in sccm)"

…So, "ID0,S100" Enters a Set-point of 100 sccm …AND

"ID0,S10250" would enter a Set-point of 10250 sccm or 10.250 SLPM

User Menu:

- S Command: Flow Set Point (Sxx.xx/Sxxxxx in sccm)

- R Command: Flow Read-Back (R)

- V Command: Valve Enable (V0=Disable / V1=Enable / V = Current Status of Command)

- P Command: Purge (P0 = Purge Off / P1= Purge ON (Valve ON Full) / P = Current Status of Command)

- C Command: Cal Select (CA = Cal-A / CB = Cal-B / C = Current Status of Command)

- D Command: Default Select (D0 = Factory Default / D1 = User Default / D = Current Status of Command)

- I Command: ID# (Enter 0-99 <return> to change ID#)

- M Command: Menu (Displays User Menu)

- U Command: Unit Info (Displays P/N, S/N, & Software Version for the Device)

- N Command: Name (Device Name Given By User)

- Z Command: Auto-Zero (Z0= Disable Auto-Zero, Z1= Enable Auto-Zero, ZZ=Auto-Zero Device Now,

Z = Current Status of Command)

- ? Command: Shows examples of Commands

Example: To set a flow rate of 430 sccm enter ID0,S430 <return>

Example: To change the calibration from Cal-A to Cal-B enter ID0,CB <return>

Example: For the MFC to read-back the current flow rate enter: ID0,R <return> Response: 430 sccm (86% FS)